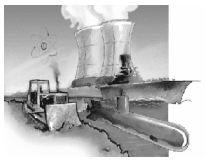
Steam Reforming of Low-Level Mixed Waste



Developer: Thermochem, Inc.
Contract Number: DE-AR21-95MC32091
Crosscutting Area: N/A

Mixed Waste FOCUS AREA

Problem:

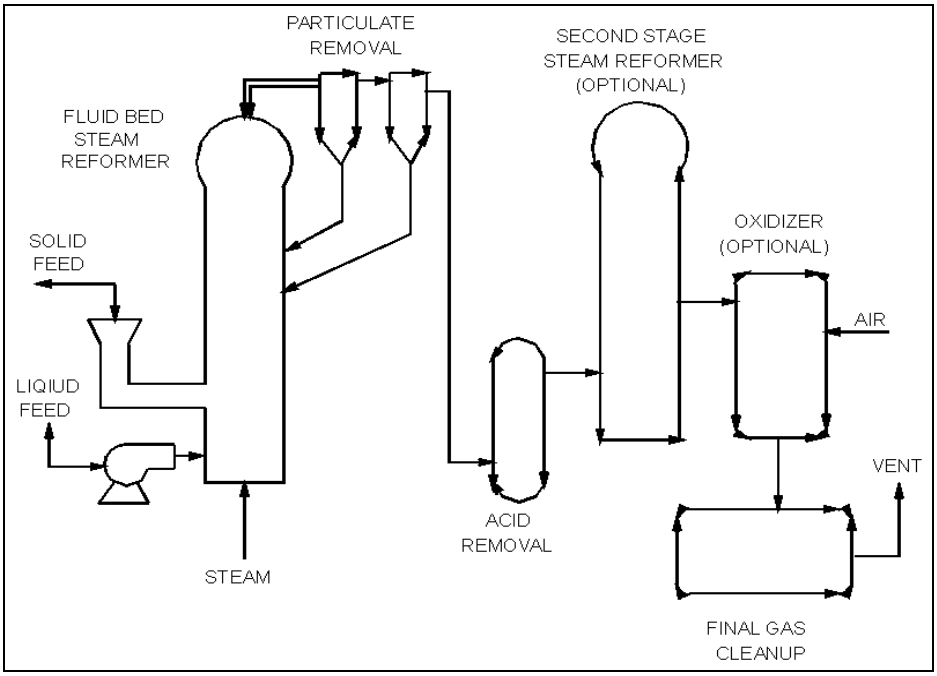
The DOE has generated, and continues to generate, large quantities of low-level-mixed waste (LLMW) that requires treatment prior to disposal. Treatment systems are needed that reduce the volume of waste for final disposal, isolate the radionuclides in an acceptable final waste form, and destroy the hazardous component(s) in the LLMW. Existing treatment systems are expensive to operate and difficult to permit.

Solution:

A patented steam-reforming system which reacts the LLMW organics with superheated steam, generating a hydrogen-rich gas, and isolates the radioactive and nonradioactive inorganics in a form readily suitable for encapsulation and/or vitrification. Steam reforming takes place in an indirectly heated, fluidized-bed reactor resulting in high throughput, high-flexibility, complete organic destruction, and improved economics.

Benefits:

- Non-incineration method for treating a wide variety of low-level hazardous waste and LLMW
- Volume reductions of 20-200 to 1
- Destroys hazardous organic materials (99.99+%), with no dioxin formation
- Final waste streams easily coupled with vitrification and/ or encapsulation for final disposal of LLMW



Technology:

Thermochem is the exclusive licensee to the patented steam-reforming system developed by Manufacturing and Technology Conversion International, Inc. (MTCI). The heart of this steam-reforming system is an indirectly-heated, fluidized-bed reactor. Superheated steam fluidizes the bed and reacts with the organics in the waste feed material. The fluidized bed offers an ideal environment for effecting the endothermic steam-reforming reaction while retaining high processing throughput.

The steam-reforming reaction converts organics to a hydrogen-rich synthesis gas and converts chlorinated compounds to HCl which is subsequently removed. Dioxins and furans are not formed and, in fact, if dioxins are present in the feedstock, they will be destroyed in the reducing environment of the reactor. In the LLMW application the steam reformer is operated at temperatures that ensure retention of the lower-melting-point inorganics and radionuclides in the bed. The inorganic bed material is removed and processed for final disposal using a technique such as vitrification. The synthesis gas is catalytically oxidized and released as carbon dioxide and water vapor.

The Thermochem steam-reforming system has been successfully tested on a wide spectrum of feedstocks such as biomass, industrial sludges, municipal solid waste, and sewage sludge. In 1995, a long duration demonstration test was successfully completed in a 5,000 pound-per-hour system processing caustic spent liquor from a wood pulping mill.

The project is to establish the commercial capability of the Thermochem steam-reforming system to treat LLMW from the DOE inventory. Extensive testing of a wide range of surrogate materials will be conducted on a Process Development Unit. The objectives are to evaluate and demonstrate the technical and economic capability of the Thermochem system to destroy the hazardous components with greater than 99.99%, isolate and stabilize radionuclides, and significantly reduce the volume of low-level hazardous and LLMW.

Contacts:

Thermochem, Inc. has extensive experience in the processing of difficult-to-treat materials and has commercialized steam-reforming technology in various applications. Thermochem is applying its experience with this innovative technology to solving DOE's needs in the treatment and disposal of low-level. For information on this project, the contractor contact is:

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DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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